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*February 1956*

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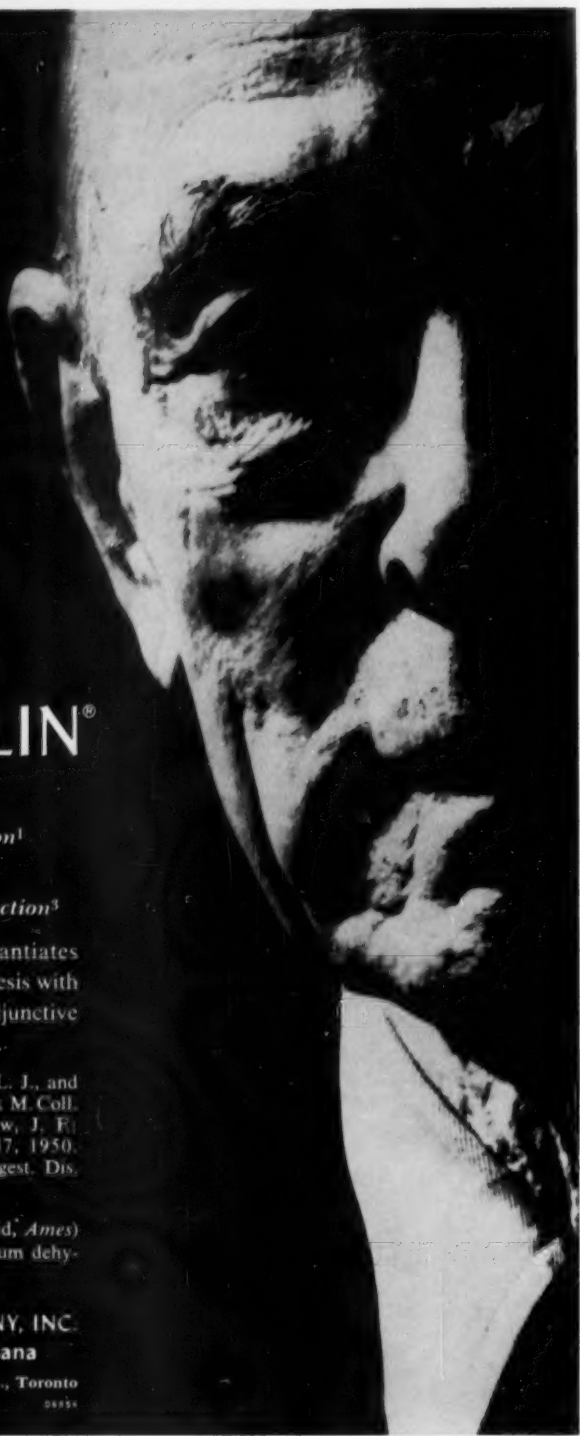
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Rubin, S. H.: Bull. New York M. Coll.  
16:102, 1953. (2) Crenshaw, J. F.;  
Am. J. Digest. Dis. 17:387, 1950.  
(3) King, J. C.: Am. J. Digest. Dis.  
22:102, 1955.

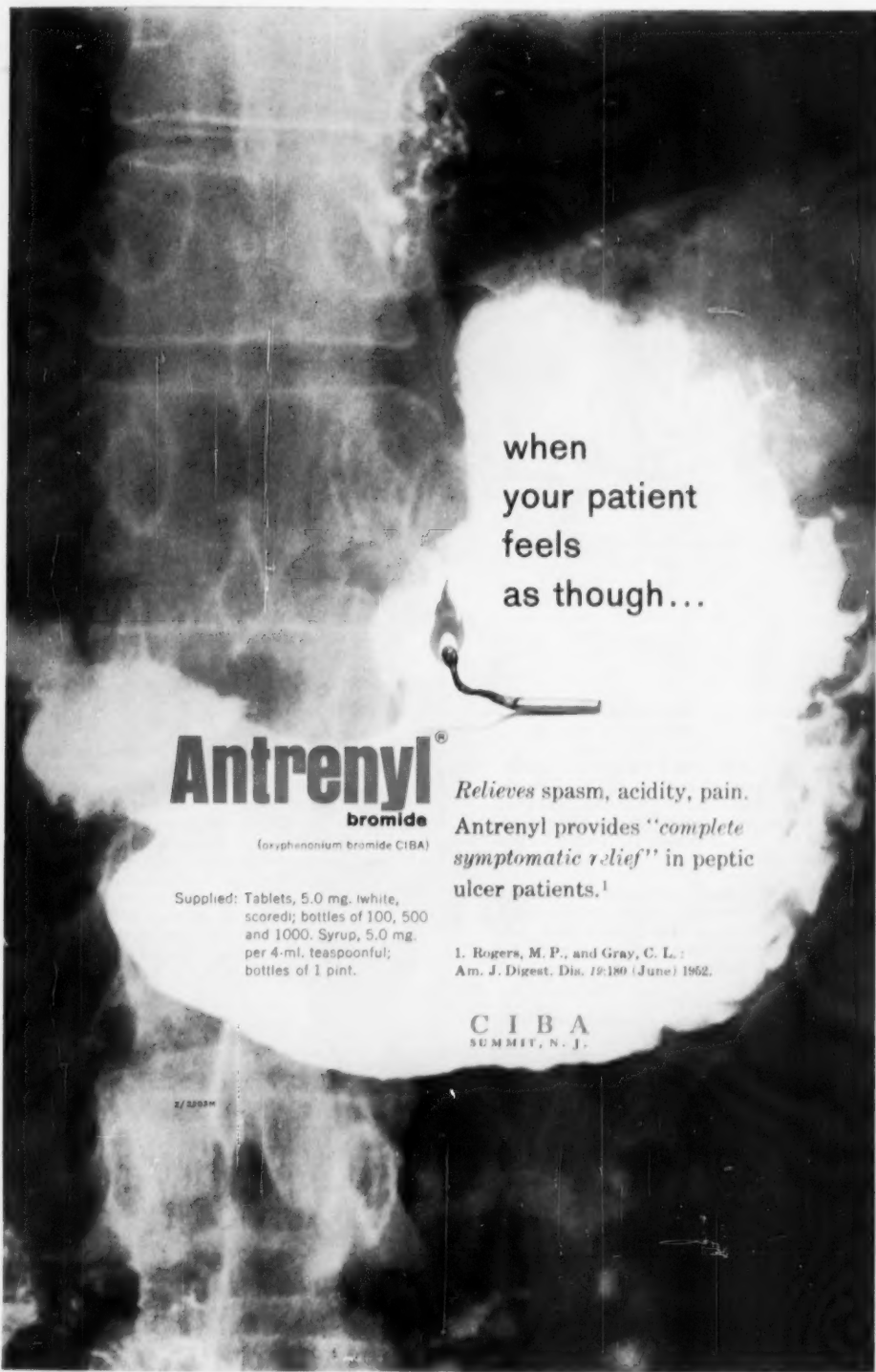
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New Series    Volume 1    Number 2

*February 1956*

ROENTGEN ASPECTS OF THE PAPILLA OF VATER <i>Maxwell H. Poppel and Harold G. Jacobson, M.D.</i>	49
DIAGNOSIS OF BOWEL OBSTRUCTION <i>Louis T. Palumbo, M.D. and Thomas C. Glenchur, M.D.</i>	59
EXSANGUINATING HEMORRHAGE DUE TO REFLUX ESOPHAGITIS <i>David Roth, M.D.</i>	70
CONTROL OF THE COLOSTOMY <i>Albert S. Lyons, M.D.</i>	79
PEARLS OF GASTROENTEROLOGY <i>Eddy D. Palmer, M.D.</i>	95

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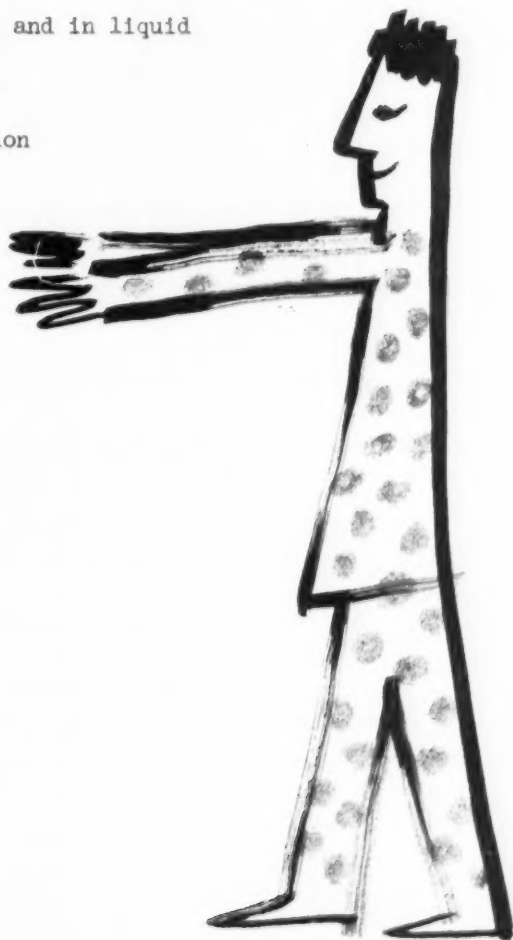
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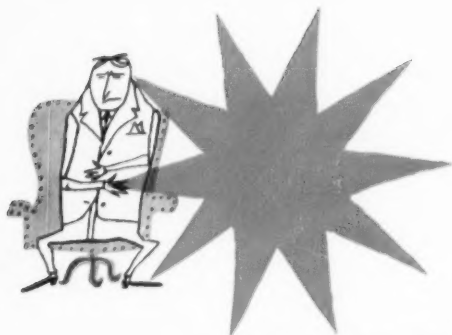
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# *Roentgen Aspects of the Papilla of Vater*

MAXWELL H. POPPEL, M.D., and HAROLD G. JACOBSON, M.D.

**W**HAT are the roentgenologic criteria for appraising any given papilla of Vater as normal or abnormal?

The inability properly to answer this question represents the primary stimulus for this study. We have been able to collect certain specific roentgen data as the result of (1) special roentgen and microscopic studies on the normal vaterian segments of over 100 post-mortem specimens, and (2) many surgical and postmortem follow-ups on cases of vaterian disease. Accordingly, it is the purpose of this study to develop these data into definitive roentgen criteria in order that the vaterian region may be better understood in health and disease.

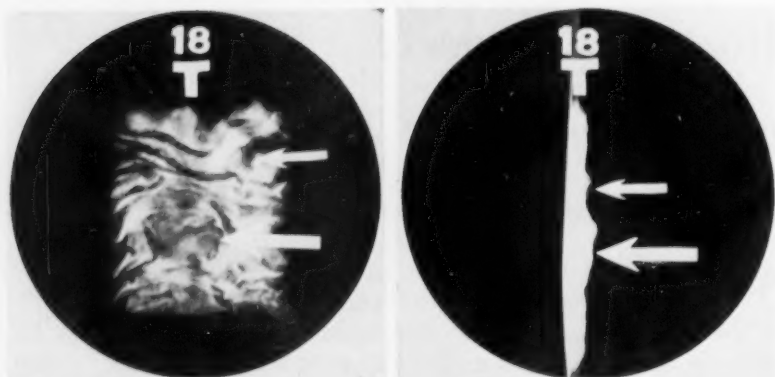
## **MATERIAL AND METHODS**

The anatomic material was limited to fresh normal specimens unassociated with any history, symptoms, or gross evidence of disease referable to the biliary tract, pancreas, or duodenum. Each of the 100 specimens was sectioned and its normalcy established by microscopic section. Each specimen consisted of the duodenal loop and attached head of the pancreas and was prepared in the following manner:

### **Technic**

The duodenum was opened by a longitudinal incision through the lateral (outer-curvature side) wall of the second portion and the papilla of Vater identified. A segment of duodenum about 6 cm. square, at the center of which was located the major papilla with the adjoining minor papilla (located proximal and anteriorly), was cut from the wall of the duodenum and dissected free from adherent pancreatic tissue. Thus the final specimen consisted of a square of duodenal mucosa and underlying muscularis, out of the center of which protruded the major duodenal papilla.

From the Departments of Radiology of New York University College of Medicine and Bellevue and Montefiore Hospitals, New York, N. Y.



*Fig. 1. Frontal and lateral views of a normal anatomic specimen. Large arrows are directed to the papilla of Vater, the small arrows to the minor papilla. The original specimen was cut along the greater curvature side and laid open so that on the frontal view we are looking directly at the papilla, which is situated in the middle of the specimen and corresponds to the medial border of the duodenum.*

The specimen (mucosal side up) was then placed on a piece of cardboard and a mixture of barium sulfate and water applied to its mucosal surface, so as to simulate conditions obtained during a barium study of the upper gastrointestinal tract. The specimen was then placed on a cardboard cassette on top of the x-ray table, and a frontal view was taken in order to demonstrate the size, shape, and relationship of the major and minor duodenal papillae, nature of the peripapillary mucosa, and so on. Each specimen bore its number and a *T* indicating the top of the specimen. Most had a large arrow pointing to the major papilla and a smaller arrow to the minor papilla (Fig. 1). Next, a silhouette (lateral) view (see Fig. 1) of the specimen was taken to show the relation of the papilla to the surrounding duodenal mucosal folds and to determine its size, shape, and position in this view. This was obtained by attaching the above specimen to a thin sheet of radiolucent material (mucosal side free). This was then fixed in a position at right angles to the plane of the film and an exposure made, showing protrusion of the papilla from the surrounding mucosal folds if it were of sufficiently great dimension to do so.

Many of the specimens had a mixture of barium sulfate and water introduced into the duodenal lumen and filmed before they were cut open. In all of these the major duodenal papilla was readily demonstrated.

## Vater's Papilla

### ROENTGENOGRAPHIC OBSERVATIONS

#### Position

The major papilla was consistently found in the 100 postmortems to be situated on the medial wall toward the posterior aspect of the mid-descending duodenum (Fig. 2). In 99 specimens the site of junction (when present) of the common bile duct and pancreatic duct was within the papilla.

The orifice (or orifices) through which the biliary and pancreatic



*Fig. 2.* Normal papilla of Vater seen midway down the descending duodenum on the medial border.

secretions enter the duodenum was directed caudally and held in that position by a longitudinal fold of mucosa which formed a caudal continuation of the papilla of Vater.

#### Shape and Dimensions

The papilla of Vater was most frequently found to be longitudinally elliptical or cylindrical in shape, with its long axis parallel to the long axis of the bowel and protruding into the lumen from the medial wall (toward the posterior aspect) of the mid-portion of the descending duodenum (Fig. 3*A* and *B*). A few round and cone-shaped papillae were encountered. The average length of the papilla of Vater in the 100 specimens examined was 1.5 cm., average width 0.5 cm. Sizes varied from 3.0 cm. long  $\times$  1.2 cm. wide  $\times$  1.2 cm. high to 0.1 cm. long  $\times$  0.1 cm. wide  $\times$  0.1 cm. high.

#### Minor Papilla

In all specimens there was a minor duodenal papilla (Santorini) as well as a major papilla. The minor papilla was on the average 1.8 cm. away from and in front of the major papilla. Occasionally they were found to exist in much closer relationship. The minor papilla most often appeared to be merely a smaller form of the major papilla. In 1 case it exceeded and in 2 instances equalled the major papilla in size.

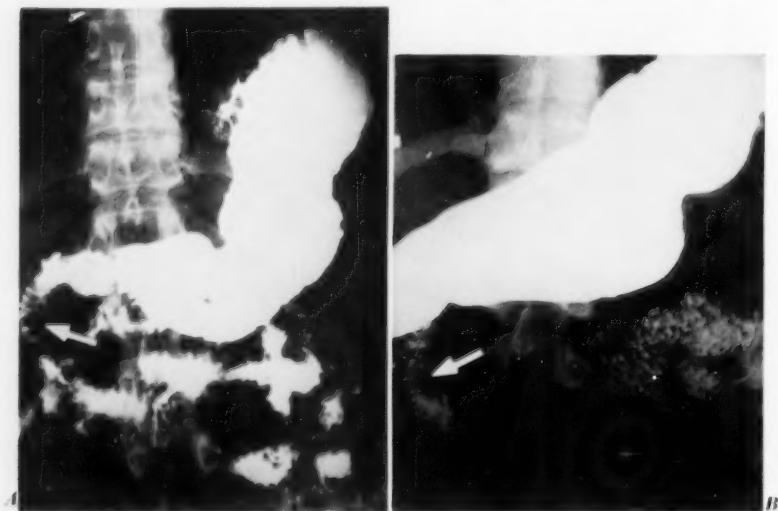


Fig. 3. *A*, arrow points to a normal large papilla. *B*, same as *A*.

## Vater's Papilla

### Peripapillary Duodenal Mucosa

The peripapillary mucosal patterns in all instances were similar to the mucosal pattern in the adjacent duodenum, with the exception of the longitudinal fold which was a caudal appendage of the papilla and lay at right angles to the transverse mucosal (valvulae conniventes) folds.

A regular finding was that of a transverse fold which formed a hood just above part or all of the papilla. This transverse fold was dependent upon the size of the duodenal mucosal folds in its vicinity for its size, being relatively smaller when the regional folds were smaller and larger when they were larger. In some cases this fold was of sufficiently great dimension to overhang and completely obscure from view the major duodenal papilla. In others this fold was barely perceptible, and the papilla was in full view.

### Peripapillary Duodenal Diverticula

Four of the specimens were noted to have peripapillary duodenal diverticula which passed out through the hiatus (duodenal window) formed by the bile and pancreatic ducts in their oblique passage through the duodenal musculature.

## ROENTGEN CRITERIA IN VATERIAN DISEASE

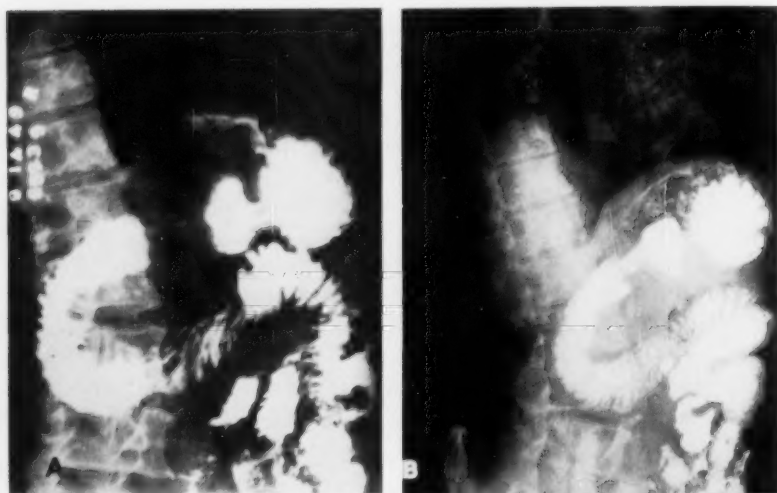
We have educed from the above-described studies some concrete criteria to aid in standardization of the appraisal of vaterian disease.

### Dimensional Abnormalities

This requires a study in three dimensions—*length*, the diameter parallel to the long axis of the descending duodenum; *width*, the diameter perpendicular to the length; and *depth*, the extent of projection into the duodenal lumen as appreciated by the roentgen view which best demonstrates the papillary profile (Fig. 4A and B and Fig. 5).

### Irregularity in Shape

In the normal adult the vaterian papilla is regular in outline and blends in smoothly with the surrounding mucosal pattern. It appears as a smooth, regularly outlined, mucosal nipple-like elevation or dome-shaped papilla longitudinally elliptical. It may be seen to be placed beneath a prominent hoodlike plica circularis situated immediately above it. From the lower margin of the papilla a firm ridge of mucous membrane descends for a considerable distance and acts as a frenulum fixing the papilla and directing its apex downward.



*Fig. 4. A, papillary sign. Note enlarged papilla,  $2.5 \times 1.8$  cm., found during the initial phase of an acute relapse of pancreatitis. Note also small calcifications in the head of the pancreas. B, return of papilla to normal size 11 days later.*

Though the regularity of the descending duodenal mucosa is interrupted by this special area, the over-all regularity of the outline can readily be appreciated by the roentgenologist. The normal papilla has a "built-in" appearance. Irregularity itself in the absence of a regional duodenitis is an important finding indicating an abnormality. The importance of irregularity is heightened by an increase in size of the papilla or one of the other abnormalities to be described.

#### **Abnormalities in the Peripapillary Regional Mucosal Pattern**

In the normal immediate peripapillary region there is a series of permanent or primary folds of mucosal origin which are known variously as the valvulae conniventes, the primary circular folds, the plicae circulares, or the valves or plicae of Kerkring. In addition to these primary folds, there may be visualized the secondary folds of Lesshaft when the duodenum is empty and contracted. These secondary folds will disappear on duodenal distention.

Is there any irregularity or distortion among the primary folds? Are the folds increased in size (thickened or broadened) with broadening of the intervening spaces? If so, is this increase in size uniform? Is it just localized to the peripapillary region or is it present throughout the duodenum?

## Vater's Papilla



**Fig. 5.** Note calcareous deposits in pancreatic head, as well as enlarged papilla (papillary sign), indicating a relapse of pancreatitis.

Does the papillary region show normal flexibility and distensibility? Is there rigidity? Is there decreased movement on palpation, or greater difficulty in smoothing out the mucosa by pressure or stretching?

Is the duodenal caliber uniform along with the mucosal changes?

Are the mucosal folds destroyed? Partly or completely?

Is there evidence of ulceration? Perforation?

Are there imbedded or nonimbedded foreign bodies? These would include ingested foreign bodies, gallstones, intestinal worms such as *Ascaris lumbricoides*, and foreign bodies which gain entrance through direct perforation. These may perforate into the pancreas or retrograde through the duct system.

### **Abnormal Duodenal Peristalsis**

Normally this peristaltic wave progresses downward and simply passes through the papillary area without delay or disturbance of any kind. Any break, hesitation, delay, or speed-up in the peristaltic wave in or about the papillary area is a sign of morbidity. Speed-up may result from spasm and irritability (intolerance to the barium) of any origin. In some of these instances the barium may move along so rapidly that repeated serial films taken close together will fail to demonstrate the regional peripapillary mucosa.

Occasionally a papillary or ampullary abnormality may be the etiologic factor for antiperistalsis with regurgitation back into the stomach.

### **Atypical Position**

The distance from the major papilla to the pylorus varies, ranging from 60 to 139 mm. The position may be abnormal if there is a primary congenital abnormality of the duodenum, such as inverted duodenum or straightened second segment. It may also be atypical if the common duct enters posteriorly or laterally or at a higher or lower level. Occasionally there is more than one common duct opening into the duodenum.

### **Narrowed Duodenal Lumen at the Papillary Level**

In the normal the caliber of the duodenal lumen is even except where narrowed by a peristaltic contraction or where physiologically wider, as in the distal duodenum.

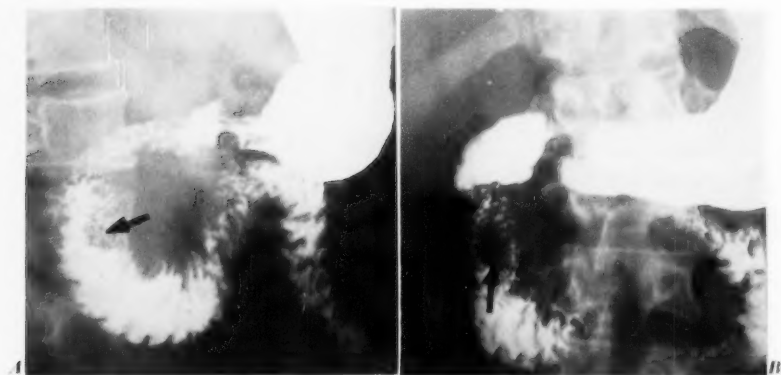
In the presence of an abnormal papillary enlargement the lumen at the papillary level will be correspondingly narrowed, while the lumen of the duodenum proximally may be widened if there is any component of obstruction (Fig. 6A and B). Spasm or intolerance to barium will narrow the duodenal lumen.

### **Diminished Mobility**

The normal abdominal viscera have no fixed shapes and no fixed positions, and every description of them must be qualified by a statement of the conditions existing at the time of observation, that in the living subject in a given posture each organ has something of a relative position.

When papillary enlargement is associated with infiltration and fixation a corresponding diminution in mobility is to be expected.

## Vater's Papilla



*Fig. 6. A, carcinoma of the papilla of Vater. Arrow points to 1.5 × 2.3 cm. mass at the papillary site. B, carcinoma of the papilla of Vater. Arrow points to 1.5 × 2 cm. mass at the papillary site.*

Vaterian structures have no independent mobility. If manipulated manually under fluoroscopic control they will be found to have a fixed relationship to the contiguous portion of the duodenum.

### Peripapillary Duodenal Diverticula

Duodenal diverticula occur most often in the peripapillary segment because of the penetration of the duodenal wall by the biliary and pancreatic ducts. They may be congenital or acquired. The roentgen examination offers the only means of a definite diagnosis.

A peripapillary diverticulum which is inflamed, ulcerated, or the site of a neoplasm may cause enlargement of the papilla by edema in the early stages or by actual extension into it at the later stages.

### Palpable Mass Fluoroscopically

Papillary masses are usually too small to be palpable under fluoroscopic control. If large enough to be palpable such a mass is probably not of primary vaterian origin.

## **PATHOLOGIC CLASSIFICATION OF VATERIAN DISEASES**

### **Congenital Large Papilla**

Simple large papilla  
Heterotopic tissue

### **Primary Benign Tumors**

Papilloma (caruncle), cyst,  
adenoma, lipoma, and fibroma

## **Poppel & Jacobson**

### **Malignancies**

Carcinoma  
Miscellaneous  
  Leiomyosarcoma  
  Melanosarcoma  
  Round-cell Sarcoma  
  Malignant degeneration  
    of heterotopic pancreatic tissue

### **Secondary Malignant Tumors**

Extension from  
  Pancreas  
  Duodenum  
Common bile duct  
Regional nodes

### **Inflammatory Diseases**

Inflammation  
Edematous swelling  
Benign inflammatory (adenomatoid hyperplasia)

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# Diagnosis of Bowel Obstruction

LOUIS T. PALUMBO, M.D., and THOMAS C. GLENCHUR, M.D.

**T**HE diagnosis of the existence, location, and underlying cause of small- or large-bowel obstruction is dependent upon many factors, among which are the history, symptoms, physical findings, and a battery of diagnostic procedures and laboratory tests. When these are properly performed and assessed and are used in conjunction with good clinical judgment seasoned with clinical experience, the physician and surgeon will seldom err in diagnosis and the management of these problems.

The careful evaluation of these patients on an individual basis is imperative. Present-day methods of early restitution of electrolyte balance and circulating blood volume and also correction of dehydration coupled with an earlier surgical attack, when indicated, have been the important factors in the reduction in the morbidity and mortality rates seen in recent years.

## HISTORY

A careful history is a great aid in establishing a background for the condition, for repeated bowel obstruction in an individual with a history of previous surgery is much in favor diagnostically of a mechanical type of obstruction due to adhesions or associated complications.

## SYMPTOMS

### Colicky Pain

The occurrence, type, severity, frequency, and location are the most important symptoms and will frequently indicate the site of obstruction. In a high ileal obstruction the pain occurs oftener than every 3-5 minutes, whereas in the lower ileum the interval is about twice as long. The pain is colicky, abrupt in onset and termination. It increases in intensity with an agonizing seizure and terminates suddenly. In the interim there may be no pain or only a dull ache. Paraumbilical

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From the Department of Surgery, Veterans Administration Center, Des Moines, Iowa.

Grateful acknowledgment is given to the Department of Radiology, Veterans Administration Center, Des Moines, Iowa, for use of the roentgenograms from their museum files.

pain is usually indicative of small bowel obstruction. Pain in other areas of the abdomen may indicate segmental small- or large-bowel obstruction.

### **Borborygmi**

Borborygmi accompany the colicky pain and peristaltic rushes. The intestinal sounds are usually of a high pitch when distention occurs. The occasional tinkling sometimes heard represents only the normal ebb and flow of intestinal content and is not the true noise associated with a peristaltic wave.

The character of the sound is dependent upon the amount of gas and liquid content of the lumen of the distended bowel. If the bowel is markedly distended with gas, these sounds are metallic or bell-like; if there is considerable fluid in the distended loops, bubbling or gurgling noises will be heard. When paralysis of the bowel occurs, colic and borborygmi diminish or disappear. The tinkling sounds which remain usually represent an eddying of the flow of intestinal contents due to gravitational or positional changes rather than actual propulsion by peristalsis.

### **Vomiting**

Vomiting occurs early in a high small-bowel obstruction. It generally is not present in a low bowel obstruction unless it is associated with a complete and long-standing obstruction, or unless it is entirely reflex in nature. The vomiting associated with obstruction is usually due to accumulation of and back flow of salivary, pancreatic, and biliary secretions. The quantity of all these secretions passing a given point in a normal individual varies; usually 8-10 L. at the duodenal-jejunal and midileal junctions and in lesser amounts at lower levels.

The vomitus assumes a feculent character after complete obstruction. This is related to the length of time the bacteria-laden luminal contents remain in the presence of bile in the intestine; it is virtually unrelated to the level of the block. The vomiting of feces never occurs in small- or large-bowel obstruction except in the presence of a gastro-colic fistula. Therefore, the term "feculent vomiting" only means that the vomitus looks and smells like feces. In general, feculent vomiting indicates ileal obstruction, for persistent vomiting does not occur with a large-bowel obstruction even though there is great distention. This is usually due to a competent ileocecal sphincter.

## **Diagnosis of Bowel Obstruction**

### **Absolute Constipation**

Absolute constipation can be misleading and an unreliable symptom and finding. Good results with an enema, or partial bowel evacuation after an acute onset of abdominal pain, may be misleading. It is important to recognize that this is actually evacuation of feces distal to the obstruction. The same may pertain to passage of some flatus. A diagnostic enema may be helpful but its use should be tempered with caution. Certainly, if administered, it should not be trusted to a ward aide or nurse. When the returns are clear, and remain clear thereafter without gas, obstruction is suggested. If perforation or gangrene of the colon is suspected, an enema is not indicated, for its instillation could result in complete spillage of the colonic contents into the free peritoneal cavity.

### **EXAMINATIONS**

General appearance in the early stages can be misleading, since the patient may not show signs of a serious illness. However, at later stages, the dehydration, toxemia, electrolyte imbalance, and decrease in circulating blood volume result in general physical changes which are readily apparent—the sunken features, anxious expression, pallid skin, feeble pulse, coldness of the extremities, and clamminess of the body.

#### **Abdominal**

The abdominal examination in an early case may not be very revealing. The abdomen may be soft and flaccid without guarding. The degree of distention is dependent upon the locality of the obstruction and the period of time elapsed from the onset to the time the patient is seen.

Normally there is a concavity below the costal arch. If this is obliterated, distention is present. It is easier to detect distention by observing the abdomen from a side view. The presence or absence of shifting dullness can be determined to rule out ascites.

#### **Rectal**

Rectal examination should be made in all cases. Lesions in the anal or rectal canal can be readily palpated. If an ileus is present the rectal ampulla is dilated, but in a mechanical obstruction the ampulla is collapsed and if empty folds snugly about the finger.

### Proctosigmoidoscopy

Proctosigmoidoscopic examination is a valuable adjunct when a low large-bowel obstruction is suspected, for by this means any lesion within 12 inches from the anal verge can be readily visualized. In early cases of volvulus of the sigmoid this procedure may obviate an open surgical decompression.

### DIFFERENTIAL CONSIDERATIONS

In review, a high small-bowel obstruction is characterized by profuse progressive emesis with dehydration and scanty urine, rise of non-protein nitrogen and hemoconcentration, with minimal distention and comparatively late obstipation. In a low small-bowel obstruction the distention is more marked, resulting in severe local effects upon the distended bowel, whereas in a colon-rectum type of obstruction the distention is more symmetrical and usually of a higher degree, associated with abdominal colic and constipation, but usually not accompanied by nausea and vomiting. When the latter occurs it is generally early and is a reflex type.

Large-bowel obstruction develops more slowly than small-bowel obstruction, but once the obstruction has persisted long enough for the blood supply to the bowel to be impaired, the condition may become hopeless. Marked biochemical changes that develop rapidly in small-bowel obstruction are not seen in colon obstruction. Early in left colon obstruction, distention occurs, the peristaltic rushes are far less frequent (every 30-40 minutes or longer) than in ileus, so that the patients may be relatively comfortable in spite of the extreme distention. Volvulus of the sigmoid causes the greatest distention. There usually is no tenderness or rigidity, but if so, strangulation is suggested. Vomiting is less frequent.

### RADIOLOGIC SIGNS

Radiologic examinations are indicated in addition to other examination and frequently will establish the diagnosis and level of the obstruction. Films showing gaseous distention in the small intestine plus the symptom of colic usually indicate probable small-intestinal obstruction; gaseous distention of the large intestine with colic indicates probable large-bowel obstruction. Gaseous distention of both large and small intestines may indicate ileus; however, gaseous distention of both small and large bowels with colic indicates probable large-bowel obstruction with an incompetent ileocecal valve. Infrequent excep-

## Diagnosis of Bowel Obstruction

tions to these criteria may be seen, since resolving reflex ileus may be associated with gas pains and a late mechanical obstruction may not be accompanied with colic. Also, a closed-loop type of obstruction may show no unusual gas pattern (see Figs. 1 and 2).

Gas shadows normally may be seen on the x-ray films in the stomach and colon but not in the small intestine in the adult. Its presence suggests mechanical obstruction, paralytic or reflex ileus. Gas is seen in the small bowel within a few hours after obstruction.

If a scout film shows no gas in the colon in the presence of signs and symptoms of obstruction, and in the presence of an effectual enema or recent bowel movement, mechanical obstruction of the small bowel exists.

### Small-Bowel Patterns

In dilatation of the jejunum and upper ileum proximal to the obstruction, the loops of bowel assume a transverse direction by virtue of the mesenteric attachment. This gives a herringbone and stepladder pattern (Figs. 1 and 2) due to the type of mucosal folds, the valvulae conniventes, normally present. These valvular folds are absent in the lower ileum; as a result of this, the distended loops of ileum on the films will appear smooth. In loop obstructions, the dilated loops assume no definite position; however, they may reveal a characteristic isolated distended segment (Fig. 3).

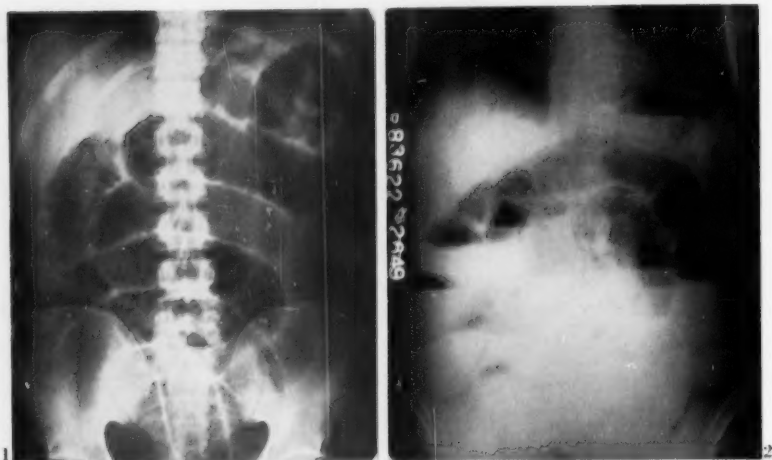
The finding of fluid levels in the loops of distended small bowel is a more valuable diagnostic sign than gaseous distention alone (Fig. 4; see Fig. 2). It is important that lateral decubitus and upright films be taken in addition to a supine film to demonstrate fluid levels. A lateral film may show distended loops which may not be seen on an antero-posterior view. These points are clearly demonstrated in Figs. 1, 2, and 4.

### Large-Bowel Patterns

Large-bowel gas is usually visualized in the long axis of the body near the lateral borders of the abdomen; the intestinal walls are thicker than those of the small bowel, and haustral markings are usually visible (Fig. 5).

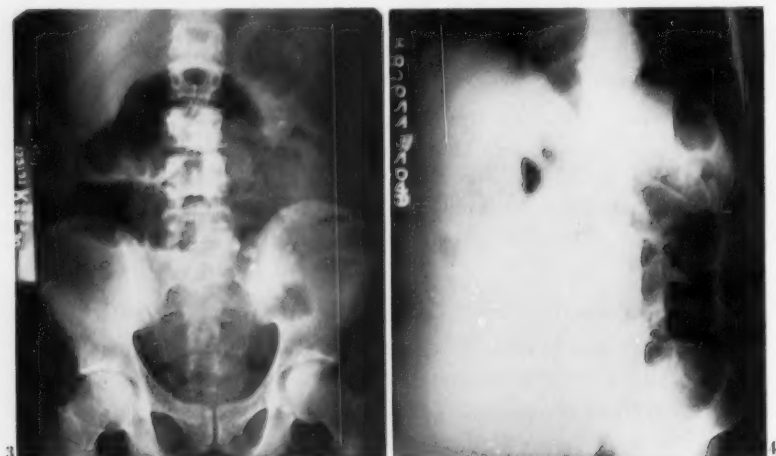
The colon may be filled with feces, in which case the characteristic gas shadow may be absent. This is especially true in the descending colon. The colon proximal to fecal accumulation may be markedly distended with gas.

In cases of volvulus of the sigmoid, the distended loop may rise out



**Fig. 1.** Small-bowel obstruction revealing typical herring-bone and stepladder pattern. Upper loops of small bowel assuming typical transverse position of loops. The valvulae conniventes are prominent in the upper loops.

**Fig. 2.** An upright film revealing the typical multiple fluid levels in the distended loops of small bowel.

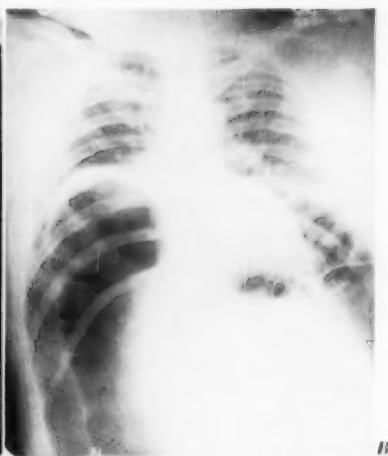


**Fig. 3.** A typical closed-loop obstruction of the upper small bowel. The presence of the mucosal folds indicates that this is an upper small-bowel loop without the characteristic position shown in Fig. 1.

**Fig. 4.** Lateral decubitus view showing distended loops with multiple fluid levels in the lumen of the small bowel.

## Diagnosis of Bowel Obstruction

*Fig. 5.* A low large-bowel obstruction revealing marked distention of the ascending, transverse, and descending colon. The wide gas shadows assume a lateral, vertical and transverse direction in relation to the body contours. There is some evidence of small-bowel distention, too, representing incompetency of the ileocecal valve.



*Fig. 6A and B.* X-ray films taken in the upright position in case of a typical volvulus of the sigmoid. There is marked distention of the sigmoid with it occupying the entire right half and upper aspect of the abdominal cavity, pushing both leaves of the diaphragm upward. The descending colon is filled with feces. There is no gas shadow in the rectum.

of the pelvis into the midabdomen and right upper quadrant to occupy the entire abdomen to the level of the diaphragm (Fig. 6A and B). If this is a closed loop, fluid levels may be seen. More precise information can be obtained in these cases by barium enema. However, this

technic is fraught with danger from perforation, inability to siphon off the barium caught in the closed loop, and further distention which may compromise the circulation to the segment of bowel and hasten gangrene and other complications. If the obstruction is complete, the instilled barium may reveal the site of obstruction and produce a film which shows an ace-of-spades or bird-bill pattern associated with spiral bands of linear density. Spot x-rays may show the corkscrew arrangement of mucosa more satisfactorily, and this finding is pathognomonic of volvulus.

### STRANGULATION

Strangulation usually involves the small bowel as a result of a mechanical type of obstruction. The diagnosis is usually based upon the symptoms and physical and x-ray signs. The pain is usually continuous and has lost the intermittent colicky nature of the simpler bowel obstruction. Back pain and signs of peritoneal irritation are present. In the latter, there is tenderness of the abdomen associated with muscle spasm and rebound tenderness. Usually a mass is palpable; there is shifting dullness because of accumulation of peritoneal fluid which, when aspirated, is usually bloody. There are signs of systemic reactions such as fever, leukocytosis, shock, and rapid pulse. The abdomen may become silent. The patient may pass dark blood per rectum. Persistence of shock, biochemical abnormalities, and hemoconcentration despite conservative management are evidence of possible strangulation.

### CAUSES OF OBSTRUCTION

The types and causes of obstruction are innumerable. Space does not permit extensive elaboration of the various factors, all of which should be considered when obstruction is encountered. These are post-operative adhesions, external or internal hernias, tumors of any type in the small or large bowel, intussusception, volvulus of sigmoid or cecum, diaphragmatic hernia, diverticulitis, endometriosis, gallstones, hair balls, congenital adhesions, congenital bowel anomalies, Meckel's diverticulum, mesenteric cysts, mesenteric vascular occlusion, regional enteritis, ulcerative colitis, strictures, fecal impactions, megacolon, tuberculosis of the cecum and nonspecific granuloma of the colon, worm impactions, ingestion of foreign materials and in rectal insertion of these by psychotic patients, and intra-abdominal abscess from any cause.

## Diagnosis of Bowel Obstruction

In a large series of cases reported, the most common causes for obstruction are adhesions and bands, strangulated external hernia, tumors, intussusception, and volvulus.

## MORTALITY

The decrease in mortality in recent years is based upon many factors, one of which is the earlier establishment of diagnosis and the earlier institution of definitive therapy. The decrease of the over-all mortality from 26 per cent in 1926 to 10 per cent in 1950 is based upon many factors. The nasogastric-intestinal suction as advocated by Wangenstein, advancements in operative technic, earlier surgical interference, antibiotics, careful attention to fluid and electrolyte requirements, and the correction of deficits in the circulating blood volume have all contributed immeasurably to a reduction in mortality.

The chemical studies now available in most well-equipped hospitals and laboratories are a great aid to the physician and surgeon in calculating the daily requirements of these patients from the standpoint of replacement of sodium, chlorides, potassium, water, plasma, and whole blood. The caloric needs can also be maintained parenterally for a period of time. These chemical studies become an integral part not only of diagnosing the cause of the obstruction but also of determining the support necessary to maintain the patient in electrolytic, fluid, caloric, and nitrogen balance. Without these important refinements, the morbidity and mortality rates will remain high.

The main causes of death are water and salt imbalance, strangulation, and/or prolonged distention associated with toxic absorption.

## NASOGASTRIC-INTESTINAL SUCTION OR DECOMPRESSION

The object of nasogastric-intestinal suction is removal of swallowed air and accumulated secretions, thus providing some relief of distention without operation, and/or preparation of patients for surgical intervention. It can be used as a diagnostic tool also; however, its continued use alone is not justified in suspected strangulation, intussusception, volvulus, unyielding strictures, congenital atresias, incarcerated hernias, failures of spontaneous relief of obstruction after 12-24 hours, or in obstructions of the colon.

The diagnostic criteria indicating successful decompression by nasogastric suction are alleviation of pain; decrease of tenderness, distention, and pulse rate; effectual enema or small stool; presence of gas

in the colon on x-ray; return of peristalsis; and positive gastric balance. If intubation suction is used it is important that the patient be checked every 4 hours. Unreasonable procrastination in the use of this method to avoid surgery will lead to a higher mortality.

Nasogastric-intestinal suction should be continued, whether the patient is treated surgically or conservatively, until (1) peristalsis is heard with cessation of gas pain and there is a decrease in the distention, (2) fluid withdrawn no longer contains bile, if gastric suction is used, (3) oral fluid balance has risen to 80 per cent of the oral intake, (4) plain x-rays of the abdomen show gas shadow in the large bowel with no distention or fluid levels in the small intestine, and (5) temporary discontinuation of suction is tolerated without recurrence of pain. If doubt exists, the tube should be left down and clamped off. If no clinical symptoms or x-ray signs develop, it is safe to remove the nasogastric tube.

#### SUMMARY

The over-all management of bowel obstructions including early diagnosis, has been improved considerably during the past 10 years. Early restoration of fluid and electrolyte losses, blood replacement, antibiotic therapy, early nasogastro-intestinal decompression, and prompt operative intervention (when indicated) have all contributed immeasurably to the reduction of the morbidity and mortality rates. The frequent and careful evaluation of each case plays an important part in arriving at an accurate diagnosis, which aids in the choice between conservative management or surgical intervention.

The various laboratory and roentgenographic studies now employed contribute a great deal toward an early and correct diagnosis. Proper interpretation of these studies, in conjunction with good clinical judgment and experience, will bring about more successful results in the problem of bowel obstruction.

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## **CASE REPORT**

# ***Exsanguinating Hemorrhage Due to Reflux Esophagitis***

DAVID ROTH, M.D.

**W**ITHIN THE PAST DECADE, the pathogenesis and symptomatology of hiatus hernia and the accompanying esophagitis have been considerably clarified. Herniation of a gastric pouch through the diaphragmatic hiatus occurs in as many as 3.5 per cent of patients having gastrointestinal x-ray studies,<sup>1</sup> and is accompanied by incompetence of the "pinch cock" mechanism at the gastric cardia. Reflux esophagitis frequently follows, producing the characteristic heartburn and "dyspepsia."

### **SYMPTOMS AND TYPE OF BLEEDING**

The frequency of bleeding is not easily determined, since many hiatus hernias are asymptomatic. Van Hoek and Musselman<sup>2</sup> found a moderately severe anemia in 17 (42 per cent) of their 36 patients, and 57 per cent had stools that contained occult blood. Bleeding is usually slow, with anemia or tarry stools as the only sign, but occasionally massive hemorrhage occurs.<sup>3, 4</sup> The patient may present himself with symptoms due solely to the secondary anemia, as in the 20 cases reported by Schwartz and Blumenthal.<sup>5</sup> Hemorrhage may be due to congestion or ulceration in the gastric pouch or, as in the case reported below, to an erosion in the esophagus.

### **Peptic Ulcer**

Barrett<sup>6</sup> has recently defined a small group of cases in which an actual peptic ulcer forms, either in the supradiaphragmatic gastric pouch or in heterotopic gastric mucosa in the esophageal wall. He believes that most of the serious complications—massive hemorrhage, perforation and stenosis—occur in these patients with "peptic ulcer of the esophagus." Barrett feels that reflux esophagitis may either

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## Reflux Esophagitis

heal, remain a chronic process, or progress to scarring and stricture formation. While oozing may occur from the erosions accompanying reflux, exsanguinating hemorrhage with autopsy confirmation has not been reported previously.

The case below is presented to demonstrate the serious bleeding that may occur with reflux esophagitis. Neither a "Barrett ulcer" nor any heterotopic gastric mucosa was found at autopsy.

### CASE REPORT

H. H., a 42-year-old office worker, was first seen in December, 1949, complaining of anginal pain of recent onset. The anginal pain was brought on by exertion, was relieved by rest and nitroglycerin, and was otherwise completely classical in symptomatology. He had no other complaints at this time.

Examination revealed an obese, white male (weight 204 lb., height 5'5"), with a blood pressure of 164/104 and otherwise was negative. Electrocardiogram was normal. There was a slight trace of albumin in the urine with no abnormal formed elements. The patient had known of the albuminuria for many years.

### Complaints and Symptoms

He continued to have angina over the next 2 years without any increase in severity. In 1951 he began to note epigastric fullness and nausea after meals, which was aggravated by lying down. His angina became much more severe after meals than it had been previously. Two gastrointestinal x-ray examinations failed to reveal a hiatus hernia, although this was specifically sought.

In December, 1953, the patient had several severe attacks of anginal pain with electrocardiographic changes suggestive of subendocardial infarction. The electrocardiograms subsequently reverted to normal and, with warmer weather, his angina became less severe. For the first time, the patient then made a determined effort to lose weight and follow a medical regimen and, for a few months, became almost asymptomatic. His angina then returned and, with it, the symptoms suggestive of a hiatus hernia. A third series of gastrointestinal x-rays again failed to demonstrate reflux or hiatal insufficiency. An electrocardiogram showed further T-wave changes.

After several months of rigorous medical therapy, there was no improvement in his angina. A coronary occlusion seemed imminent and further therapy seemed urgent. He was having a great deal of nausea and "heart-burn." Pericardial poudrage with exploration of the diaphragmatic hiatus seemed to offer this patient relief with minimal risk.

### Presurgery Findings

Accordingly, he was hospitalized on October 15, 1954. At this time he weighed 190 pounds and had angina after walking one block and after emotional disturbances. His blood pressure was 160/100. Heart sounds were of good quality, with no murmurs and a regular rhythm. A blood count and urinalysis were normal. The fasting blood sugar was 126 mg./100 cc. and the NPN was 29 mg./100 cc. An electrocardiogram showed T-wave changes indicative of myocardial damage.

### Surgical Procedures and Findings

On October 18, a left thoracotomy was performed by Dr. I. A. Sarot. The esophagus was explored and a hiatus hernia the size of a small orange was found with 2 inches of the cardiac end of the stomach protruding into the chest. A paragastric extraperitoneal lipomatous pad projected into the mediastinum, posterior and lateral to the stomach. This was resected. The peritoneal covering of the stomach was then plicated to the under-surface of the diaphragm, bringing the esophageal-gastric junction down under the diaphragm. The diaphragmatic crura were then approximated anteriorly and posteriorly, narrowing the esophageal hiatus to permit the insertion of 1 finger beside the esophagus. Several fine silk sutures approximated the esophageal serosa to the pleural surface of the diaphragm.

The pericardium was then incised, and 5 Gm. of asbestos powder were placed on the surface of the heart after the pericardium had been abraded vigorously. The pericardium was then closed and a left dorsal sympathectomy (D<sub>1</sub>-D<sub>4</sub>) done. The chest was then closed with intercostal drainage and a Levin tube inserted into the stomach.

### Postoperative Course

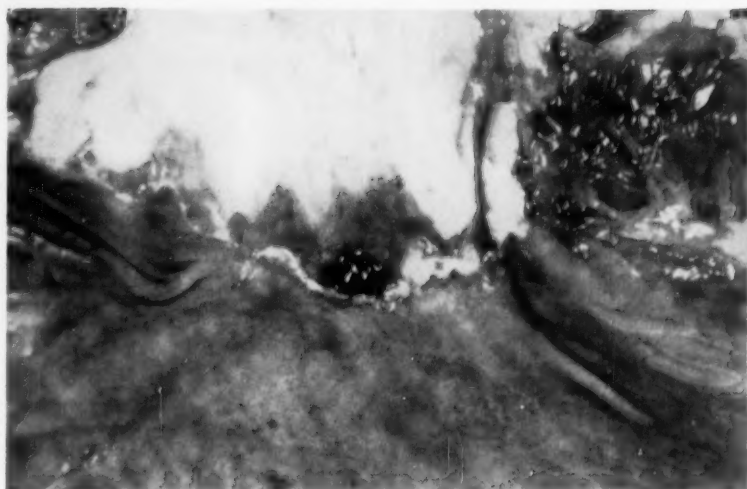
The patient underwent the procedure without any difficulty. He received a 500-cc. blood transfusion immediately postoperatively, and the Levin tube was removed on the fourth postoperative day. The first two weeks of his postoperative course were uneventful. On the fourteenth postoperative day the patient complained of feeling fatigued. He felt nauseated during the afternoon and complained of some epigastric distress, which was relieved by an antacid. At 10 p.m. he had a normal brown stool. He was then well until 1 a.m., when he suddenly went into peripheral vascular collapse. A Levin tube was quickly passed and bright red blood gushed out of the end of the tube. The patient then had a convulsion and died.

### Autopsy\*

The external appearance of the body was not remarkable. A small amount of fluid was present in the left chest and some recent adhesions were present over the left lower lobe.

\* Performed by Drs. Churg and Sender.

## Reflux Esophagitis



**Fig. 1.** The opened esophagus. In the center of the inflamed area, adherent clot hides ruptured vessel. Several periesophageal silk sutures are seen at right.

### *Heart*

The heart weighed 500 Gm. The pericardial surfaces were reddened and rough, and multiple yellow-gray granulomatous areas were seen. There were many epicardial adhesions. The valves were normal. The myocardium was reddish brown in color and firm. The anterior wall of the left ventricle was thin (1 cm.) and many white fibrous patches were found immediately below the endocardium. Both coronary arteries showed extensive atheromatous deposits with narrowing of the left circumflex and almost complete obstruction of the left anterior descending artery. The aorta was atheromatous but still elastic.

### *Esophagus*

The esophagus was of average caliber and thickness. It was easily separated from the other mediastinal tissues but was slightly adherent to the pericardium. At the hiatus the esophagus was fixed to the diaphragm by black silk sutures running between the periesophageal tissues and the crura of the diaphragm. None of the sutures penetrated the smooth, gray esophageal mucosa. No large vessels were caught by a suture.

Upon opening the esophagus, the junction of esophageal and gastric epithelium was irregular in outline. Just above the junction, the esophagus presented a reddish-tan zone of granulation tissue 0.5-1.5 cm. in width. This tissue completely encircled the lumen and was most prominent on the anterior wall where it was partially covered by a soft, red adherent thrombus measuring about 0.4 cm. in diameter (Fig. 1).

### ***Stomach and Intestinal Tract***

The stomach was tremendously dilated and contained about 2000 cc. of fluid and clotted dark-red blood. Several pinpoint-size erosions were present along the greater curvature and the posterior wall. The stomach was otherwise normal. The rest of the gastrointestinal tract was filled with fluid and clotted blood mixed with intestinal contents.

The other organs were not remarkable.

### **Microscopic Examination**

#### ***Heart***

*Pericardium.* There was extensive, though variable, granulomatous inflammation in the fat tissue, particularly around nests of foreign, crystal-line material compatible in appearance with asbestos fibers. These nests were superficial in location. The cellular infiltrate consisted of macrophages, lymphocytes, fibroblasts, and foreign-body giant cells. There were many dilated capillaries seen, some of which extended to the myocardium and a few areas of dense fibrosis.

The *myocardium* showed variation in nuclear size and staining and fragmentation of fibers. There was variable focal fibrosis, particularly in the sections of the anterior wall. Some of the fibrous areas were recent, some old and acellular. In addition to fibrosis, the anterior papillary muscle showed areas of recent hemorrhage.

The *endocardium* and the valves revealed no significant changes.

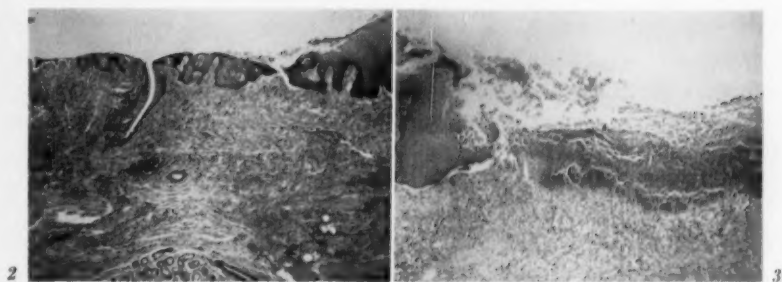
The *coronary arteries* were markedly sclerotic with extreme thickening of the intima, focal calcification, and slitlike lumina.

#### ***Esophagus and Cardia***

The periesophageal tissue above the cardia contained several silk sutures and showed chronic inflammation with many lipophages and foreign-body giant cells. The muscularis of the esophagus and the mucosa were intact, and showed no significant changes except for mild subepithelial infiltration with lymphocytes and scattered polymorphonuclear leukocytes. At the cardia, just above the squamocolumnar junction, the inflammation was more intense and extended deeper into the wall; there was fibrosis and vascularization of the submucosa with partial replacement of normal squamous epithelium by a very thin, irregular layer of epithelium (Fig. 2). The same region also showed intense acute inflammation with desquamation of epithelium, particularly marked in the anterior wall where there was actual necrosis of the tissues extending into the submucosa (Fig. 3). This corresponded to the yellow-red area seen grossly.

Sections through the adherent blood clot showed necrosis and ulceration of the wall with erosion of a large artery lying in the submucosa.

## Reflux Esophagitis



*Fig. 2.* Thin, atrophic epithelium covers the submucosa at sites of previous esophagitis.

*Fig. 3.* The mucosa is replaced by a dense layer of necrotic tissue heavily infiltrated with leukocytes.



*Fig. 4.* The ulcerated vessel lies in the center of the granulomatous tissue covered by fresh thrombus.

(Fig. 4). The blood clot revealed no signs of organization. No gastric mucosa was seen around the ulceration or in the other sections of esophagus examined.

### **Other Organs**

The liver showed minimal fatty change. The lungs were slightly congested. The spleen was bloodless but otherwise normal. The renal vessels were moderately sclerotic and the kidney showed small areas of scarring and interstitial inflammation. The other organs were completely normal.

## DISCUSSION

Allison<sup>7-8</sup> separated hiatus hernia into three different groups but felt that reflux esophagitis was a problem primarily in the sliding-hernia and short-esophagus groups. Sphincter incompetence is not found with the paraesophageal type of hernia.

### Mechanism of Reflux

The mechanism causing reflux is not clearly defined. There is very little intrinsic sphincteric action in the musculature of the esophageal-gastric junction. Reflux is probably prevented in the normal by the acute angle between esophagus and body of stomach, the oblique entrance of the esophagus, and the support lent by decussating anterior fibers of the diaphragmatic crura. Posteriorly, even in the normal, support is weak.<sup>9</sup> As the diaphragmatic opening is widened, the esophagus and stomach forms a direct line and both mechanical and geometric supports are lost. Recumbency, hypersecretion of acid, and abdominal compression can then easily cause reflux of gastric acid with erosion of the sensitive esophageal mucosa.

Apparently, reflux may also occur without herniation. Protracted vomiting and prolonged intubation may be followed by signs of severe esophagitis. Winkelstein *et al.* have shown that reflux esophagitis may occur in duodenal ulcer without a concomitant hiatus hernia.<sup>10</sup> Ulcerative esophagitis has also been noted following stress experiments and in random postmortem material.<sup>11</sup>

### Ulcer and Heteropic Gastric Mucosa

Barrett's<sup>6</sup> cases usually have a long history of esophageal symptoms and markedly deformed esophagi. In many, chronic peptic ulcers are found either in the gastric pouch or in heterotopic gastric mucosa. Small islands of gastric mucosa may be found in almost 70 per cent of routine autopsies,<sup>12</sup> but these are usually at the level of the cricoid cartilage and not associated with ulceration. Rarely a normal esophagus may show a larger patch of gastric mucosa or even be lined with gastric mucosa throughout most of its length. However, the gastric mucosa seen with a "Barrett ulcer" is usually found near a hiatus hernia and is probably drawn up as part of the reparative processes. In the case reported by Boshes and Taylor<sup>13</sup> an ulcer was associated with heterotopic gastric mucosa, but the ulcer was found at the level of the arch of the aorta. A small hiatus hernia was also found at surgery in this case.

## Reflux Esophagitis

### Symptoms and Diagnosis

The patient presented above, in addition to his angina, had symptoms of hiatal insufficiency for 4 years. Extensive and repeated roentgenologic investigation failed to reveal a hiatus hernia but the symptoms were so characteristic that the diagnosis was maintained and finally proven by surgery. Chronic dyspepsia and substernal "heartburn," especially when aggravated by recumbency, must be considered due to reflux esophagitis. The absence of a hiatus hernia on x-ray does not rule out the diagnosis. The percentage of positive roentgenologic diagnoses is increased when films are taken with the patient in Trendelenburg position or as a lateral view with the patient standing and bending forward.

### Gravity of Reflux Esophagitis

The present case demonstrates the potential seriousness of reflux esophagitis. Fourteen days after a pericardial poudrage and repair of his hiatus hernia the patient suddenly died from a massive internal hemorrhage caused by a small esophageal ulcer which had eroded into a large submucosal vessel. The ulcer was present in a bandlike area of acute esophagitis which was presumably due to reflux of gastric secretions. While the inflammation seen may have been initiated by intubation, the Levin tube was removed 10 days prior to the fatal hemorrhage and could not have caused the hemorrhage.

Microscopic examination of the lower esophagus at autopsy showed an extensive inflammatory process with actual necrosis of tissue and a marked leukocytic response. Small areas of scarring and areas of thin epithelium were also seen, indicative of past insults to the esophageal mucosa. This is borne out by the patient's long symptomatology. Postoperatively, reflux must have occurred despite the repair of the hernia. The patient was kept on rather strict bed rest for the first postoperative week and the horizontal position may have favored reflux through a sphincter partially paralyzed by recent surgery. The bed rest was deemed necessary to avoid myocardial irritability and arrhythmias after the pericardial poudrage.

No evidence of heterotopic gastric mucosa was seen in the many sections of esophagus examined. The junction between esophageal and gastric mucosa was clearly demarcated and was separated from the zone of ulceration by a distinct area of squamous epithelium. A "Barrett ulcer" seems clearly ruled out by the findings, and the hemorrhage must be attributed to simple reflux esophagitis. This

## Roth

fatal complication arose rapidly with no more warning than mild dyspepsia—present in millions of people every day.

## SUMMARY

1. A case has been presented of exsanguinating hemorrhage following repair of a hiatus hernia and due to reflux esophagitis. There was no evidence of a "Barrett ulcer" or heterotopic gastric mucosa at autopsy.

2. The recent literature has been reviewed and the potential seriousness of even a minor degree of gastric regurgitation and esophagitis discussed.

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# Control of the Colostomy

ALBERT S. LYONS, M.D.

**O**F THE VARIOUS intestinal surgical procedures, the one most feared by the patient is colostomy. Moreover, the abhorrence he may feel preoperatively is further accentuated after operation by the scant advice on the details of management which the surgeon may impart. The patient may therefore look for his chief support to the internist, gastroenterologist, or family physician. Yet here, too, he may get little help because the doctor himself may display poorly disguised insecurity or actual revulsion toward the external stoma.

However, even the physician with the most limited experience in problems of colostomy care can aid his patient inestimably if he takes the time to discuss the details, to listen sympathetically to the fears expressed, and to approach realistically the difficulties involved.

Some of the basic facts concerning colostomy, its routine care, and the management of difficulties are here summarized in the hope that they may aid the physician to approach the patient with more confidence. It is to be realized that the composite instructions, although dogmatically given, are not meant to be authoritarian or rigid. The principles and details are based on personal experience with many patients, but of course there are doubtless other methods of successful control.

## DEFINITION

The word "colostomy" means an operation that creates an opening into the colon, and, by extension, the opening itself. Lichtenstein<sup>4</sup> has suggested the further terms "external colostomy" (opening communicating with the outside) and "internal colostomy" (operative connection with an internal organ). However, in usual medical writing as well as in lay parlance, the term "colostomy" means external colostomy.

## CLASSIFICATION

Colostomy may be performed in any segment of the colon: cecal, ascending, transverse, or sigmoid (Fig. 1). In each of these areas there

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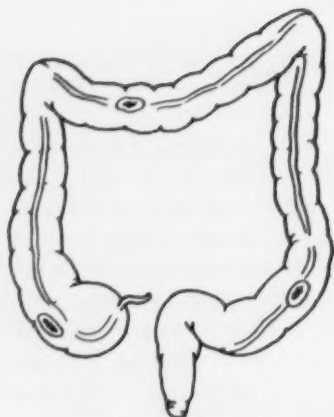


Fig. 1. Common sites of colostomy.

are special problems related to function, for the more proximal segments of the colon are apt to contain unformed or liquid feces and to function more frequently, whereas the distal sigmoid usually encloses formed fecal matter, the unscheduled passage of which can be prevented.

The anatomic configuration varies with the type of operative construction.

### Loop Colostomy

The lumen of the bowel is in continuity (Fig. 2). A loop of colon has been lifted and maintained on the abdominal wall—sometimes with the aid of an underlying glass rod through the mesentery, sometimes by suturing the abdominal wall between the proximal and distal limbs of the loop. When the bowel is opened, eversion of the

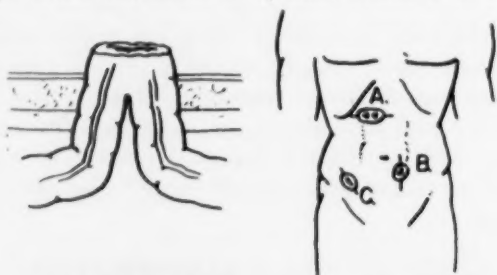


Fig. 2. Loop colostomy.

- A. LOOP COLOSTOMY IN TRANSVERSE COLON.
- B. LOOP COLOSTOMY IN SIGMOID.
- C. CECOSTOMY.

## Colostomy Control

mucosa often occurs, so that two lumina (Fig. 2, *A*) instead of one (Fig. 2, *B*) may be seen.

The cecal colostomy (Fig. 2, *C*) is also a loop colostomy. When the cecum is allowed to remain in the abdominal cavity but has an external tube sewed into the lumen, a "tube cecostomy" results.

### Uses

The loop colostomy is most frequently used for decompression in intestinal obstruction or as a complementary procedure after resection of a more distal colonic segment. It may also be used as a preliminary procedure to protect an inflammatory lesion in the sigmoid. In this instance, partial but not complete fecal diversion is produced.

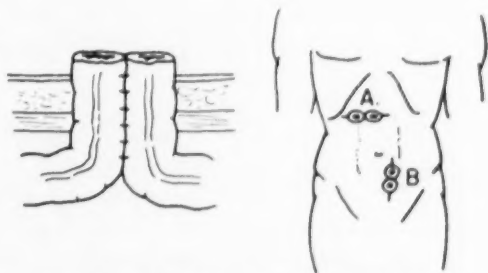
### Double Barreled with Spur

The colon has been transected and a distal and proximal opening placed together in the abdominal incision, with the two limbs sutured side by side to form a spur (Fig. 3). This spur can later be crushed or cut to re-establish intestinal continuity before closing the colostomy by an operative procedure.

### Uses

This type of colostomy usually results from an obstructive resection (exteriorization resection; Micleuz resection) of a colonic lesion. It is also used to produce a more complete fecal diversion than is obtained by the loop colostomy.

Fig. 3. Double-barreled colostomy with spur.



A. DOUBLE BARRELLED TRANSVERSE COLOSTOMY.

B. DOUBLE BARRELLED SIGMOIDOSTOMY.

### Double Barreled with Separated Ends

The proximal and distal limbs and their openings are separated either by closing the abdominal incision between them or by bringing each out through separate stab wounds.

#### Uses

This type is most often used in the sigmoid colon (Fig. 4) as a palliative colostomy when a rectal neoplasm is inoperable or as a preliminary stage in the perineal excision of a low rectal neoplasm (Lockhart-Mummery resection). Sometimes it is made in the transverse colon to produce complete fecal diversion in order to protect an inflammatory lesion in the distal sigmoid.

### Devine Colostomy

The Devine colostomy combines the features of the two previous types. The stomal openings on the abdominal wall are separated, but the colonic limbs in the peritoneal cavity are sutured side by side to form a spur (Fig. 5).

This colostomy has the advantage of completely diverting the fecal stream and yet of permitting intestinal continuity to be restored later by crushing the spur. However, it is awkward to perform and manage,

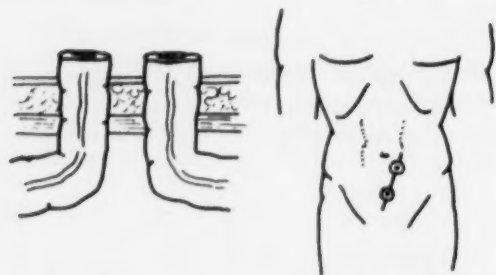
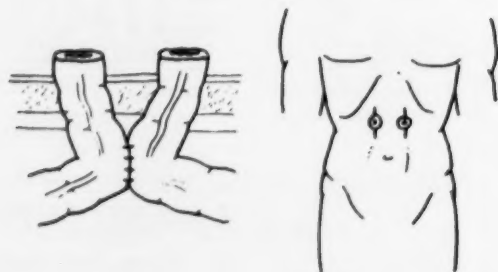


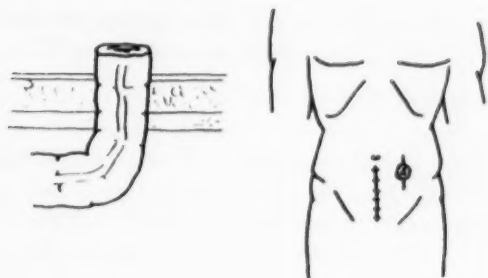
Fig. 4. Double-barreled colostomy with separated ends.

Fig. 5. Devine colostomy.



## Colostomy Control

*Fig. 6. Single-barreled end colostomy.*



and has been replaced for the most part in recent years by either the colostomy with separated ends or the spur colostomy.

### Single-Barreled End Colostomy

There is only one limb brought to the abdominal wall (Fig. 6). The colon distal to this is either absent because of removal or closed by suture and left in the peritoneal cavity. Sometimes the end colostomy is placed in or near the midline in the exploratory incision. At other times, it may be brought through a stab wound. Pronounced differences of opinion have been expressed about the optimum location of the permanent sigmoid colostomy. Evaluation of sites is not pertinent to this discussion, but I would like to state that I have used both the midline and the left lower quadrant for the stoma, with apparently equal success, except that when employing a stab wound, I think that the excision of a wafer of skin is preferable. A well-constructed colostomy opening makes management much easier, but dogmatism on what constitutes the best method is unwarranted.

The commonest form and the type most often referred to when speaking of a permanent colostomy is this single-barreled end colostomy, usually in the sigmoid, resulting from abdominoperineal resection of the rectum.

### MANAGEMENT OF THE SIGMOID END COLOSTOMY

The colostomy in each of the segments of the colon requires different principles of management. Consideration of the "wet" colostomy (with ureters implanted into the colon) and of the "running" sigmoid colostomy (when only a short segment of colon remains proximally) are not included in this discussion. The management of transverse colostomy and cecostomy must also be dealt with in a separate study. These usually require the wearing of appliances similar to the devices

needed for ileostomy.<sup>7</sup> Since the sigmoid colostomy is by far the most common, the management of this type will be summarized.

#### **Establishment of Routines**

The objective is to produce inactivity of the colon and firm stool which will not be evacuated except when the patient irrigates through the stoma. Control is therefore produced by physiologic means. An occasional patient can be found who has a spontaneous evacuation once or twice daily without irrigation, but I do not believe it is wise to expect this set of circumstances except in relatively rare instances. Moreover, a patient whose evacuations are not subject to his own manipulations is apt to feel insecure and to require either bulky dressings or an appliance in anticipation of the appearance of stool.

Before discharge from the hospital the patient should be thoroughly acquainted with the principles of management and able to perform an efficient irrigation himself without assistance. In some instances it may be permissible to allow the patient to return home in the care of a nurse who helps with the procedure, but it is usually wiser to keep the patient hospitalized longer, if necessary, until the irrigating manipulations are well learned than to permit him to leave the hospital while he still has to depend on someone else to perform these procedures. Adjustment is more complete and later activities more secure if the patient learns to follow the pattern of his new existence while he is still surrounded by the hospital environment.

#### **Diet**

The purpose is to produce a firm stool. Most patients require a low-residue diet at the start. This may be supplemented with vitamins. After control is obtained additional foods may be tried, one by one. The appearance of either diarrhea or excessively hard stools necessitates dietary modification. In order to discover the pattern of individual variation, I have usually begun with a foundation diet to which additions are made on trial, but only after regulation has already been obtained. On this gradually modified regimen some people eventually achieve a full, unrestricted intake whereas others find that they cannot violate the basic diet without the occurrence of uncontrolled fecal emissions.

**Alcohol** has unpredictable effects. Most people find that whiskies and wines in small amounts (a drink once or twice a day) create no difficulties. In a few, diarrhea is produced. Because beer not infrequently leads to the passage of much flatus, many avoid its use.

## Colostomy Control

The following dietary regimen is suggested as a pattern to be observed or modified according to individual needs:

### **Basic Diet List**

#### **Foundation diet** (to obtain regulation):

Meats: bacon, liver, beef, chicken, lamb.

Fish, boiled or broiled.

Eggs, boiled, scrambled, or poached.

Vegetables: potato, rice.

Breads: toast, white or rye; plain crackers.

Cereals: farina, Cream of Wheat, Puffed Rice or Wheat, corn flakes, Rice Krispies, strained oatmeal, noodles, spaghetti without sauce.

Beverages: weak coffee, weak tea, light cream, boiled milk.

Soups, without vegetables or spices.

Desserts and sweets: custards, cornstarch puddings, junkets, gelatins, rice puddings, tapioca, simple cakes and cookies, plain ice cream, sugar.

#### **Additions** (after regulation is obtained):

Juices: strained orange juice.

Fruits: banana, canned or cooked peaches, apricots, pears, applesauce, baked apple without skin.

Vegetables, pureed. If purees are tolerated, then try cooked vegetables: tender carrots, beets, squash, asparagus, green lettuce in small amounts with plain mayonnaise.

Milk, unboiled.

Cheeses: cream, American, and Swiss.

Desserts and sweets: Jelly or jams without seeds.

#### **Prohibitions** (these foods usually interfere with regulation):

Spices, such as mustard, horseradish, catsup, and vinegar.

Vegetables, raw: cucumbers, spinach, celery, cabbage.

Fruits, raw.

Beverages, iced, carbonated.

Cereals: brans, wheats.

Breads: whole wheat, pumpernickel.

Meats: pork, veal, duck.

Fried foods.

**Instructions to the patient:** The foregoing diet is used to produce constipation. When the colostomy is fully regulated, the additions may be tried. If the colostomy still remains regulated, further experimentation is allowed by adding one food at a time.

### **Irrigation**

This procedure is essentially an enema. Water is introduced into the colon by means of a rubber catheter inserted into the stoma. The enema fluid must in fact enter the colon and, for the most part, remain inside the colonic lumen until the introducing catheter is removed. When the appropriate amount has run in, the tube is withdrawn and the colon allowed to evacuate its contents.

#### ***The Tube***

Only soft rubber catheters should be used, varying in diameter according to the size of the stoma. Hard or rigid tips are dangerous and unnecessary. A lubricant should be used (water-soluble jelly, petroleum jelly, mineral oil, etc.). The tube should be passed only far enough to introduce water. With a few patients 1 inch is sufficient; with others, the full length of the tube is required. Introduction should never be forced.

#### ***The Water***

Plain lukewarm tap water is preferable. On occasion, mild soapsuds may be added to stimulate an otherwise sluggish colon. Sometimes other additives, such as sodium bicarbonate, have been used with good results.

**The amount of water** varies with each person's requirements. Sutherland<sup>11</sup> and associates have reported the employment of gallons of water by a few patients. Yet many may require only 1 quart. In general, most patients find that 1-2 quarts in a single instillation is effective. Sometimes, after evacuation, a second introduction of 1 or 2 quarts may be needed. Under ordinary circumstances, large amounts of water are not harmful, as the liquid remains in the colon only a relatively short time. Even the delayed evacuation of 3 or 4 quarts has never produced systemic difficulties in my experience. However, occasional instances of water intoxication have been reported when, after the instillation of 6 or more quarts, the water was not expelled or removed and was absorbed into the bloodstream.

#### ***The Schedule***

The frequency of irrigation varies among individuals from daily to once a week. The majority find most suitable a schedule of irrigation every second or third day. It is usually wise to begin this routine together with dietary management while the patient is still in the hos-

## Colostomy Control

pital. Later modifications can be made according to the comfort and needs of the patient. Most find that after breakfast the colon is more active and efficient in evacuation, whereas some find it more advantageous to choose bedtime for irrigation. Once the suitable time of day is finally established, however, this routine should be adhered to as consistently as possible.

### *Duration*

The duration of the irrigation depends on the efficiency of the patient, the rapidity with which the colon empties, and the time required for the colon to return to inactivity. The total duration of the complete procedure should eventually not exceed 45 minutes to 1 hour. During early training the process may take considerably longer. While the patient is learning, the time consumed is of secondary importance. He must first develop an understanding of the procedure and a means of obtaining a thorough evacuation before he concentrates on short cuts or rapidity.

### *Apparatus*

The simple use of a catheter, basin, and enema bag is preferred by many. Others use one of the many commercial devices which permit the patient to sit on the toilet while introducing the water and to have both hands free while liquid and feces are being evacuated into the toilet bowl by means of an outlet. I have found that most people prefer the mechanical apparatus. Among the colostomy irrigators in popular use and which I have found quite satisfactory when suited to the particular patient are: Davol, Grick, Greer, Fazio, Binkley, Pappas, Wagner, Travellor, Perry, Trask, Colostom-ease, and Nu-Komfort.

In the early training days, before control is fully established, the patient may continue to wear the irrigating apparatus about the house after he has completed his evacuation, in order to catch any unexpected secondary outflow. A special bag may also be kept available for use in case the patient should develop uncontrollable diarrhea at a time when he must appear in public, but the bag should be packed away in a drawer and never used except in an emergency.

Two other items of equipment should be added—a radio and reading material. The soothing effect of music during the irrigation has often led to great improvement in efficiency as well as to a more accepting attitude. Moreover, the wait for evacuation of colonic contents

is made to seem considerably shorter and pleasanter if the daily newspaper is being perused.

### **Interval Care**

#### ***Dressings***

When the colostomy is well controlled, no bag should be worn, for the appliances are difficult to keep odorless, may be irritating to the skin, are apt to lead to prolapse of the sigmoid by producing suction, and represent a failure of the effectiveness of diet and irrigation. Colostomies in segments of the colon more proximal to the sigmoid may require the occasional or constant use of an appliance because of the physiologically liquid state of the feces. The management of these colostomies resembles the requirements of an ileostomy and should be considered separately.

The simple sigmoid colostomy, however, should be covered by the simplest dressing that suits the patient: a small pad of soft gauze, a square of plastic film (e.g., cellophane, or a layer of light cellulose cotton). Dressings may traumatize the exposed mucosa and cause bleeding. To prevent this, a thin layer of petrolatum or other bland ointment should be spread on the material in contact with the stoma. Women may wear their girdles over the light dressing and men may desire a wide elastic waist band (from an athletic supporter). Some find a ribbon of muslin used as a loose binder more comfortable. The patient often chooses his own type of covering. In this he should be encouraged except that he must get to the point of being secure without bulky dressings.

Special inserts or restraining cups have been successfully used on occasion to prevent the passage of gas for limited periods of time. The Lanson apparatus, for example, consists essentially of a tube with an inflating balloon at the end which is inserted into the colostomy and held in place by a belt or binder, for the purpose of blocking any emissions. Although an occasional patient may find it useful for special occasions (I know of one who wears it all the time), most people in my experience find it uncomfortable and only partially effective. Although it has the theoretical objections of being a source of trauma to the mucosa, I have not so far discovered any ill effects. I would reserve its use for special instances. Most of the time, an improvement in dietary and irrigating technics is needed rather than a special apparatus.

**Cleaning.** The skin about a colostomy may be cleaned with soap

## Colostomy Control

and water. Baths or showers are permissible at any time. Mineral oil is sometimes effective as a cleanser for the surrounding skin after an irrigation has caused the colostomy to function.

### **Odor**

The unexpected passage of flatus with an offensive odor is one of the most disturbing problems and very difficult to control. Of course, the avoidance of accidental bowel movements by a well-executed regimen of irrigations is the first essential, but even those who have succeeded in complete control of colostomy activity may find flatulence with odor a persistent difficulty.

**Locally** the dressings may be saturated with Airwick or sprinkled with a deodorant powder (such as that distributed by the Greer Co.). Competing odors may be tried. A few drops of oil of pine often completely masks feculent odors. Some women find that perfume is useful. The problem of how to avoid leaving an offensive odor behind in a bedroom or bathroom after irrigation is often solved by burning either a kitchen match or a small incense packet, such as Aromettes. At one time the insertion into the colostomy of a capsule containing charcoal was thought to be worthwhile but most patients have found the method ineffective.

**Systemic control** of odor may be achieved often by avoidance of specific foods (different in each patient) which seem to engender odoriferous gas or stool. Onions, garlic, spices, fish, egg yolk, and vegetables of the cabbage group are sometimes implicated as the offending agents. People with odor problems of course should avoid all charged waters (seltzer, ginger ale, beer, etc.).

**Oral intake of deodorant substances** has not yet been fully evaluated. Activated charcoal is an old standby which may have value in specific instances. A capsule containing activated charcoal and phenyl salicylate (distributed by the D.O.D. company) is claimed to be quite effective by some patients. Chlorophyll had a vogue which has not been maintained. However, the recent development of a highly concentrated chlorophyll preparation (by the Rystan Company) is worth a trial.

### **Psychologic Management**

#### ***Preoperative***

Total management of the patient with colostomy should begin with preoperative preparation.<sup>6</sup> He should be aware at least of the possi-

## Lyons

bility that the operation may leave him with an external opening. The method of indicating this eventuality must be adapted to the patient. At any rate, immediately after operation he should certainly be informed gently and simply that he has such an opening before he has the devastating experience of discovering this for himself.

### *Postoperative*

From the time of operation, the surgeon or physician must give attention and reassurance in large measures. Taking the time to go over details is rewarding both to the patient and to the doctor, who will thereby find his later duties simplified. Intelligent and optimistic nursing personnel in the hospital and an efficient social service department can perform wonders in leading a patient into cheerful adjustment.

Visits from another person with a similar type of colostomy may be of great help in bolstering morale and in yielding useful information. However, the visitor should be carefully chosen lest he try to impose his own methods which sometimes are not suited to the patient. Since each person's requirements are somewhat different, the objective should be to encourage by example rather than by imposition.

### *Later Support*

After discharge from the hospital the patient must not be discarded, for, away from the protective surroundings, he may once again become fearful and insecure. Moreover, even under the best of circumstances, he may come upon variations and difficulties in colostomy function which require aid. Frequently only the informed surgeon or experienced physician can help him. I have therefore made a practice of continuing to see postoperative colostomy patients at regular, frequent intervals. I have also followed this procedure for the indigent patients at the Mount Sinai Hospital in a special clinic devoted to problems related to external stomas.<sup>6</sup> While it is true that much medical and mechanical help is thus administered, it can also be seen that receptive listening to a patient's simple, unhurried recitation of difficulties in management has often led to mastery of the problems by the patient himself without further aid.

At home the surrounding attitudes may condition the patient's own view of himself. The physician's activities, therefore, in reassuring and educating the members of the family contribute greatly to the adjustment by the patient to himself, his colostomy, and his environ-

## **Colostomy Control**

ment. "One must steer a middle course, on the one hand giving the patient time, attention, instruction, and encouragement; on the other hand, avoiding an attitude which may lead to fixation on his infirmity and to overdependence on outside help."<sup>5</sup>

### **MANAGEMENT DIFFICULTIES**

#### **Excessive Looseness of Stools**

When the stool becomes semiliquid or liquid, control is difficult to maintain and frequent, unpredictable emissions occur. In colostomies located in the transverse colon or cecum this state of the feces is often the physiologic norm, but in sigmoid colostomies looseness has other causes which should be sought and corrected.

#### ***Dietary Indiscretion***

When diarrhea suddenly occurs in a previously controlled colostomy, irritating foods may be the cause. A stricter dietary regimen may be necessary. Some people need a strict low-residue diet at all times to avoid looseness.

#### ***Emotional Upset***

It is surprising how often psychologic tensions lead to irregular colostomy function. Control can be re-established if the aggravating situation is discoverable and amenable to remedy, but reassurance alone may in itself be effective.

#### ***Inefficient Irrigation Technic***

Incomplete evacuation at irrigation or retention of water may lead to the constant seepage of liquefied stool.

#### ***Irritative Colitis***

This may be associated with a systemic infection or irritating medicaments. Sometimes it represents a true ulcerative colitis. If due to actual inflammatory change in the colon, a "running colostomy" is created that may defy all attempts at control and require containment with an appliance as with ileostomy. A trial with drug therapy is worthwhile, using opium, bismuth, anticholinergics, atropine, or phenobarbital.

#### ***Achlorhydria***

Occasionally, the unsuspected absence of gastric acid may be a cause.<sup>2</sup> Restoration is then feasible by means of dilute hydrochloric acid or capsules which release the acid.

### Excessive Firmness of Stool or Sluggish Colon

Either a particularly inactive colon or excessive drying of stool may lead to prolonged, difficult irrigations with incomplete evacuation. Some patients develop a hard, resistant stool when on a low-residue regimen. They are fortunate, for it is much simpler to stir up the colon and liquefy stool than to control diarrhea. If the diet is gradually increased to include a greater variety of foods, the desired stool consistency can usually be attained. Sometimes the taking of fruit juices about twelve hours before irrigation time will make the stool less firm and the colon more active during irrigation. Sometimes the addition of soapsuds to the water may stimulate more activity. Cool water, rather than warm, increases colonic movements.

The instillation of warm olive or mineral oil into the stoma 15 to 30 minutes before irrigation may soften the stool sufficiently to permit more effective dislodgement on irrigation with water. The preliminary introduction into the stoma of Aerosol O.T. (1 oz. of 1% solution) has also been effective in my experience. Occasionally a very small dose of a mild cathartic such as milk of magnesia 8-12 hours before irrigation is useful. Considerable caution, however, is required to avoid diarrhea. At the present time I am investigating the use of cholinergics at the time of irrigation to increase colonic activity and simplify the irrigation procedure. Results so far are promising. Neostigmine given by mouth 20 minutes before the irrigation often promotes colonic activity sufficiently to speed up the evacuation.

### Accidents

When sudden, unexpected, fecal emissions occur during the day or night, the colostomy cannot be considered controlled. A search should be made for stimulating foods in the diet, emotionally upsetting factors, and errors in irrigation. The same treatment may be employed as is used to manage excessively loose stools: dietary control, correction of faulty irrigation technic, promotion of emotional ease, and the elimination of irritative substances.

Sometimes the accidental emission is found to occur for the most part several hours after irrigation. The usual cause for this secondary outflow is the retention of water in the colon which is expelled later together with stool. The water has usually been trapped behind stool because of too rapid instillation,<sup>2</sup> which causes the liquid to run around too far into the proximal segments of the colon. Slowing down the injection of water into the stoma during irrigation by shutting off

## Colostomy Control

the flow intermittently may solve the problem. Atropine taken immediately after completion of the irrigation may lessen the tendency to secondary outflow.

### Inability to Introduce or Retain Water

One of the common causes of resistance to instillation of water is the presence of hard stool which blocks the lumen. The same methods suggested to soften excessively firm stool may be used here. Sometimes the dislodgement of a few pieces of hard feces by a preliminary flushing may permit the subsequent easy introduction of water.

Patients who have an unusually active or irritable colon may require a mild sedative before beginning the irrigation. No additives should be used in the water, which should be comfortably warm and therefore less stimulating.

Water can be prevented from escaping during the instillation by introducing the irrigating catheter through a small hole at the top of a wide-mouthed nipple which is pressed firmly against the stoma to block the exit. A similar device is a small metal cup (distributed by the Greer Co.) which can be used in the same way.

### Excessive Cramps During Irrigation

The common causes are too rapid instillation of water,<sup>9</sup> irritating fluid, and hyperirritability of the colon. This can often be corrected by slowing the instillation, using plain warm tap water and a clean apparatus, prescribing a sedative or atropine before the irrigation, and reassuring the patient so that he is relaxed during the procedure.

## SUMMARY

The goal of colostomy control (of the sigmoid colostomy) is the attainment by the patient of security, normal activity, and freedom from the fear of fecal leakage. The sentinels which guard this security are psychologic adjustment, a well-constructed stoma, an efficient system of irrigation, a suitable interval between irrigations, and an adequate diet suited to the patient, which avoids diarrhea and produces constipation without impaction.

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# Pearls of Gastroenterology

## The Esophagus

**EDITOR'S NOTE:** The Journal is privileged to present below excerpts from a collection of capsules of gastroenterologic information compiled over the years by Dr. Eddy D. Palmer, Chief of Gastroenterology, Walter Reed Army Hospital, Washington, D. C. Dr. Palmer is a member of the Editorial Board of this Journal.

### Physical Examination

¶More than any other organ, the esophagus suffers from neglect at the time of routine physical examination. It shouldn't. The esophagus is not inaccessible to the stethoscope.

¶The esophagus is examined by auscultating the swallowing sounds and timing the interval between initiation of deglutition and emptying of the esophageal ampulla (*Am. J. Digest. Dis.* 19: 309, 1952).

This is a measure of the swallowing time and permits detection of an isolated lesion or diffuse disease which either obstructs or interferes with esophageal motility. Because of nonspecificity and all-inclusiveness, it is particularly helpful and coarse as a diagnostic technique.

Normal swallowing time is about 7 seconds (patient in upright position).

### Anatomy

¶Rather regularly in the adult, the distance from the alveolar ridge to

**AUTHOR'S NOTE:** This is a potpourri of favorite information about gastroenterology, compended for the use of doctors who may find a succinct source-book helpful. The information is strictly random information, some included because it is important, some because it may easily be overlooked during the reading of the detailed standard texts, and some because it may have special meaning for gastroenterology as it is practiced during this particular era.

Some items are passed off with a reference or two when no pearl seemed particularly pertinent, so that there would be at least this brief mention of the subjects. The references which follow some of the statements do not, by any means, indicate the sources of the statements, but rather places to look for further information.—E.D.P.

the cricopharyngeus muscle is 15 cm., and from cricopharyngeus to esophagogastric junction, 25 cm.

¶The three important, normal, extrinsic pressure defects on the thoracic esophagus, from above down, are arch of the aorta, left bronchus (not pulmonary artery or its primary branches, which do not make contact with the normal esophagus), and left atrium.

¶Space of Lannier-Hackerman separates posteriorly the cricopharyngeus muscle from the rest of the inferior pharyngeal constrictor. This is the path of Zenker's diverticulum.

Space of Laimer: posterior orad

## Pearls of Gastroenterology

defect in the outer longitudinal muscle layer of the esophagus.

### Physiology and Neurology

¶Clinical importance of the physiologic constrictions of the esophagus has been grossly overemphasized.

¶"Curling" indicates multiple segmental spasms of the esophagus, giving it a string-of-beads configuration. Spasms may migrate or remain stationary until eradicated briefly by the peristalsis of swallowing. Frequently found in old men. Rare in young people.

¶Esophageal secretion is under control of the vagi.

¶Most air swallowed by habitual air-swallowers goes down no further than the esophageal ampulla.

### Ampullary Contraction Ring

¶This is a rather constant, thin, symmetrical, ringlike contraction which in some people partially divides the ampulla in two. Diagnosis is made radiologically. Esophagoscopic examination usually fails to demonstrate the phenomenon, and biopsies of the ampulla in the area show only normal tissue. Although, of course, most instances have been found in people who have complained of trouble in the region, it is questionable whether clinical significance is implied. Some observers believe that the ring marks the level of attachment of the ascending sheet of the phreno-esophageal membrane (*Gastroenterology* 23: 419, 1953; *Am. J. Roentgenol.* 70: 911, 1953).

### Congenital Anomalies

¶Chalasia: cardioesophageal relaxation. Atropine may occasionally bring out a sphincteric action at the cardia. In about 85 per cent of cases there is other important disease of the gastrointestinal tract, heart, or kidneys. Pyrosis is not a symptom. Aspiration pneumonia is a great danger in the neonatal period.

¶Esophageal atresia, with or without esophagotracheal fistula, occurs in about 0.01 per cent of live births. Untreated, atresia and fistula promise a survival time of only  $4.8 \pm 3.5$  days (*Johns Hopkins Hosp. Rep.* 18: 259, 1919). X-ray finding of large amounts of air in the stomach and bowel of the neonate is strong evidence of fistulous communication between tracheobronchial tree and esophagus (which is patent below the fistula).

### Dysphagia Lusoria

¶This is symptomatic esophageal compression caused by an arteria lusoria. Arteria lusoria is an aberrant right subclavian artery which arises as the fourth branch of an otherwise normal aortic arch, passes posteriorly and to the right, behind the esophagus, before continuing toward the right shoulder. This is the commonest anomaly of the aortic arch system, the incidence being reported as 0.6-1.8 per cent at autopsy. There is frequent association with other vascular anomalies.

¶Dysphagia lusoria is very much

## Pearls of Gastroenterology

less common than the mere presence of an arteria lusoria.

¶The subjective illness may be most disabling but this is due largely to chronic panic. Discussion and explanation are more effective than one might suppose.

### Spontaneous Rupture

¶This is a most catastrophic event, but, if patient is receiving steroid hormone therapy, the moment of rupture may pass unnoticed.

Usually occurs during violent retching or vomiting, athletic activity, or sudden straining. Often encountered in alcoholics. A very rare complication of steroid hormone therapy. Not excessively rare following craniotomy (Cushing effect).

¶Blunt blows and crushing injuries to abdomen rarely produce esophageal damage.

¶Almost all ruptures occur in the distal one-third of the organ, 90 per cent in the ampulla. The slit is always longitudinal, in keeping with the laws of hydrostatics. In 10 per cent of the cases, the rent is found to be 6 cm. or more in length. In 50 per cent it is more than 3 cm.

¶Quick open mediastinotomy with repair and drainage is always indicated.

### Diverticulosis

¶The pulsion-traction classification is best avoided. Midthoracic diverticula, like the others, are almost always pulsion in origin. They begin secondary to functional

or neuromuscular abnormality, with the formation of temporary pouches which with time become permanent.

¶About 75 per cent of patients with Zenker's diverticulum are men. About 75 per cent are 50 years or more old when diagnosed.

¶Complications of epiphrenic diverticula may be serious. These are complicated mainly by chronic pulmonary disease. Carcinoma has been reported in epiphrenic diverticula. At times there is an associated achalasia.

¶Commonest problem that esophageal diverticula present clinically is their interference with the diagnosis and treatment of other disease processes (*Am. J. M. Sc.* 229: 16, 1955).

### Achalasia

¶*Achalasia*: inability of muscle of cardiac orifice to relax beyond its normal resting tone.

*Cardiospasm*: persistence of contraction beyond its normal resting tone. (Achalasia is much more common.)

¶Achalasia is a disease of the esophagus as a whole. In a sense the abnormality at the cardia is least important. Atony of the upper esophagus with absence of peristaltic activity is of primary importance.

¶The cardia normally reacts to vagal stimulation by relaxing. Achalasia is one possible complication of transthoracic vagotomy.

¶In achalasia, cardia is traversed by esophagoscope with little sense of resistance. Muscle tone is in-

## Pearls of Gastroenterology

sufficient to resist more than a small hydrostatic pressure. This is sufficient to maintain a column of barium suspension about 8 inches high in the esophagus.

¶Destruction of Auerbach's ganglion cells is the important histopathologic change of the narrow segment.

### Primary Varices

¶As a rare explanation for bleeding, varices unassociated with portal hypertension are found on the posterior wall of the cervical esophagus (*Am. J. Digest. Dis.* 19: 375, 1952).

¶This is a disease which can be detected only by esophagoscopy examination.

¶It is probable that the varices develop from abnormal caudad extensions of the posterior hypopharyngeal venous plexus, constricted by the normal action of the cricopharyngeus muscle.

### Tuberculosis

¶Tuberculosis involving the esophagus is not rare. There are several pathologic manifestations: tiny hematogenous tubercles, gross lesions of esophageal wall (rare), extrinsic involvement from mediastinal nodes with fistula formation, perforation by extension from vertebral caries, and stricture due to mediastinal tuberculosis.

¶Dysphagia in the tuberculous patient is much more likely due to pharyngeal tuberculosis than to esophageal involvement.

### Carcinoma

¶Autopsy incidence of esophageal carcinoma: 1.3 per cent (216,122 autopsies).

¶Eighty-five per cent of patients with esophageal carcinoma are men.

¶Among 11,037 cases, 22 per cent originated in the proximal third of the esophagus, 35 per cent in the middle third, and 43 per cent in the distal third.

¶Approximately 30 per cent of esophageal carcinomas are adenocarcinomas, and almost all examples of this histopathologic type are encountered in the distal segment of the organ. A majority of adenocarcinomas of the esophagus are actually carcinomas of the stomach, arising in the orad extension of the organ. Sixty-eight per cent of esophageal carcinomas are of the squamous-cell type.

¶At autopsy, only about 60 per cent of patients have distant metastases. Others die of local extensions and esophageal obstruction.

¶Although transesophagoscopy biopsy is by far the most effective diagnostic technic, there are failures. At this hospital the first biopsy has failed to include tumor tissue in about 10 per cent of cases of esophageal carcinoma. Three usual explanations for biopsy failure: intramural position of some infiltrating tumors, obstruction which precludes access to exposed tumor tissue, and simple misdirection of the forceps (*Am. J. Digest. Dis.* 22: 65, 1955).

# antacid maintenance

pH

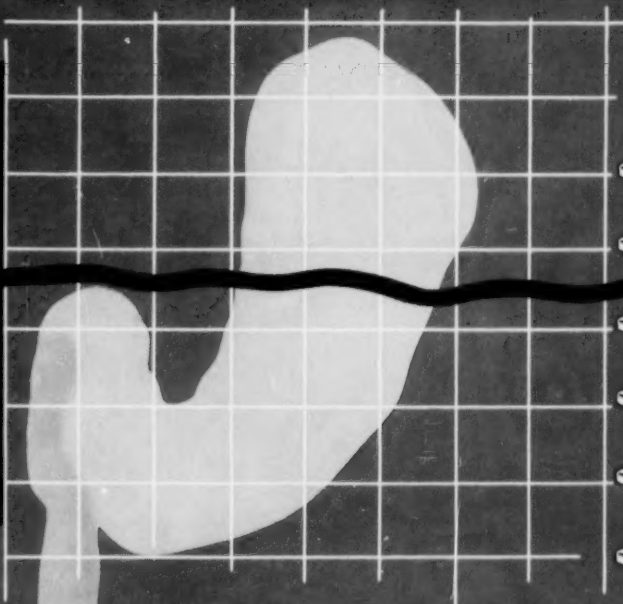
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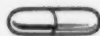
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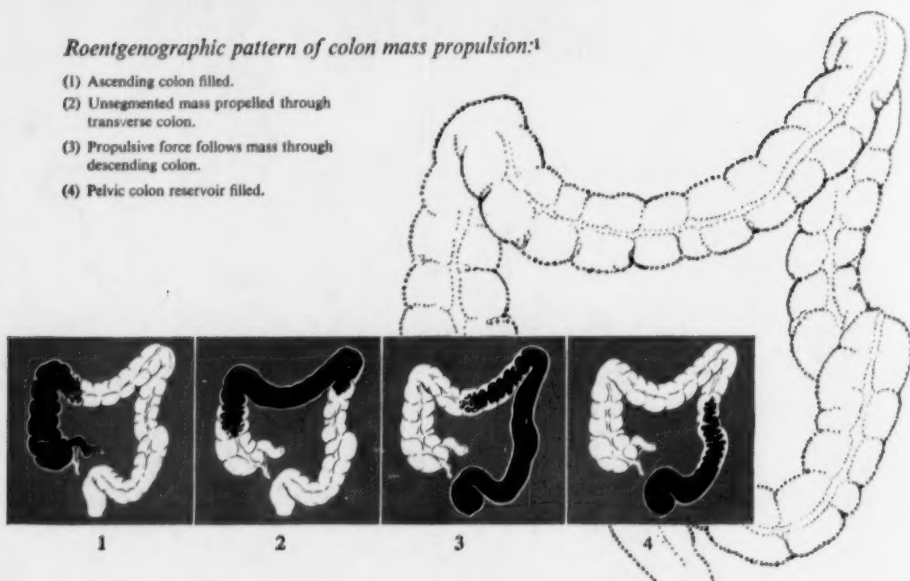
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## SMOOTHAGE ACTION IN CONSTIPATION

### *Roentgenographic pattern of colon mass propulsion:*<sup>1</sup>

- (1) Ascending colon filled.
- (2) Unsegmented mass propelled through transverse colon.
- (3) Propulsive force follows mass through descending colon.
- (4) Pelvic colon reservoir filled.



## Reestablishing Bowel Reflexes with Metamucil®

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